Cambrian group. Murchison asserted and illustrated by sections the unvarying fact that his Llandeilo flag was superior to the Upper Cambrian group. There was no difference between us until his Llandeilo sections were proved to be wrong." (Philos. Mag. IV. viii. 506.) That there must be a great mistake in Sedgwick's or in Murchison's sections was evident, and the Government surveyors, while sustaining the correctness of those of Sedgwick, have shown the sections of Murchison to have been completely erroneous.

The first step towards an exposure of the errors of the Silurian sections is, however, due to Sedgwick and McCoy. In order better to understand the present aspect of the question, it will be necessary to state in a few words some of the results which have been arrived at by the Government surveyors in their studies of the rocks in question, as set forth by Ramsay in the Memoirs of the Geological Survey. In the section of the Berwyns, the thin bed of about twenty feet of Bala limestone, which (as originally described by Sedgwick) they have found outcropping on both sides of the synclinal chain, is shown to be intercalated in a vast thickness of Caradoc rocks; being overlain by about 3,300 and underlain by 4,500 feet of strata belonging to this formation. Beneath these are 4,500 feet additional of beds described as Llandeilo, which rest unconformably upon the Lingula-flags just to the west of Bala; thus making a thickness of over 12,000 feet of strata belonging to the Bala group of Sedgwick. A small portion of rocks referred to the Wenlock formation occupies the synclinal above mentioned. (Memoirs, III. part 2, 214, 222.) The second member, in ascending order, of the Silurian system, to which the name of Caradoc was given by him in 1839, was originally described by Murchison under the names of the Horderly and May Hill sandstone. The higher portions of the Caradoc were subsequently distinguished by the Government surveyors as the Lower and Upper Llandovery rocks; the latter (constituting the May Hill sandstone, and known also as the Pentamerus beds) being by them regarded as the summit of the Caradoc formation. In 1852, however, Sedgwick and McCoy showed from its fauna that the May Hill sandstone belongs rather to the overlying Wenlock than to the Caradoc formation, and marks a distinct palæontological horizon.

This discovery led the geological surveyors to re-examine the Silurian sections, when it was found by Aveline that there exists in Shropshire a complete and visible want of conformity between the underlying formations and the May Hill sandstone; the latter in some places resting upon the nearly vertical Longmynd rocks, and in others upon the Llandeilo flags, the Caradoc proper or Bala group, and the Lower Llandovery beds. Again, in South Wales, near Builth, the May Hill sandstone or Upper Llandovery rests upon Lower Llandeilo beds; while at Noeth Grug the overlying formation is traced transgressively from the Lower Llandovery across the Caradoc to the Llandeilo. These important results were soon confirmed by Ramsay and by Sedgwick. (Ibid, 4, 236). The May Hill sandstone often includes, near its base, conglomerate beds made up of the ruins of the older formation. To the north-east, in the typical Silurian country, it is of great thickness and continuity, but gradually thins out to the south-west. There exists, moreover, another region where not less curious discoveries were made. About forty miles to the eastward of the typical region in South Wales appear some important areas of Silurian rocks. These are the Woolhope beds, appearing through the Old Red Sandstone, and the deposits of Abberley, the Malverns and May Hill rising along its eastern border, and covered along their eastern base by the newer Mesozoic sandstone. The rocks of these localities were by Murchison in his "Silurian System" described as offering the complete sequence. When however it was found that his Caradoc included two unconformable series, examination showed that there was no representative of the older Caradoc or Bala group in these eastern regions, but that the so-called Caradoc was nothing but the Upper Llandovery or May Hill sandstone. The immediately underlying strata, which Murchison had regarded as Llandeilo, or rather as the beds of passage from Llandeilo to Cambrian, and had compared with the north-west passage of the Caermarthenshire sections (Syl. Sys. 416), have since been found to be much more ancient deposits, of Middle Cambrian age, which rests upon the crystalline hypozoic rocks of the Malverns, and are uncomformably overlain by the May Hill sandstone. We shall again revert to this region, which has been carefully studied and described by Prof. John Phillips. (Mem. Geol. Sur. II., part 1.)

T. STERRY HUNT

(*To be continued*)

SCIENTIFIC SERIALS

THE *Rêvue Scientifique*, Nos. 33—42. The first article in these numbers is by Prof. Huxley, on Yeast.—The conclusion is arrived at of M. de Quatrefages' course of lectures on Anthropology, at the Museum of Natural History at Paris.—M. de Fonvielle contributes an article on Balloon Observations. In No. 34. M. Léon Le Fort, Professor to the Faculty of Medicine at Paris, furnishes an account of military surgery in the Austrian army.—Among the contributions from foreign sources is a report of M. Vogel's spectroscopic observations of the planets made in 1871 at the observatory of Bothkamp.—No. 35 contains an interesting lecture, delivered at the University of Friberg-in-Brisgau, by M. Ecker, on the struggle for existence in the character and in the life of nations.—In No. 36 is commenced a report, continued in subsequent numbers, of M. Claude Bernard's course of lectures at the College of France on Animal Heat. A translation is given of a paper by Prof. Harting, of Utrecht, on the artificial production of organic calcareous formations. There are also reports of the proceedings of English and other foreign scientific societies.—In No. 37 the most interesting paper is one by Dr. Onimus, on the consecutive phenomena attendant on the removal of the brain, and on the movements of rotation, illustrated with drawings of frogs and birds, on which the operation had been performed, to show the action.—No. 38 contains a report of Prof. Virchow's address to the Congress of German Naturalists and Physicians at Rostock, on Science in the national life of Germany. Sir William Thomson's paper on the Size of Atoms is translated from an early number of this journal. M. Papillon has an article in support of M. Wurtz's aphorism, "Chemistry is a French science, constituted by Lavoisier," in reply to English and German attacks.—No. 39 commences with an important article by M. P. Lorain, on Reform in the Higher Instruction. A translation is given of M. R. Wolf's lecture at the University of Zurich on Solar Spots, and of Neumayer's paper contributed to the Vienna *k. k. Geologische Reichsanstalt* on the Jurassic Basins.—In No. 40 M. Le Fort supplements his previous paper by an additional one on Military Surgery in the Prussian army. This and the following number are partially filled with further reports of the Rostock meeting of German naturalists and physicians.—In No. 41 we find also a lecture by M. Lereboullet at the School of Military Health at Montpellier on the Spinal Column.—No. 42 contains a report of M. Blanchard's address to the Annual Congress of the Learned Societies of the Departments at the Sorbonne. M. Paul de Saint Robert contributes a paper with the suggestive title, "Qu'est ce que la force?" There are also a number of reports of the proceedings of foreign societies.

THE *Journal of Botany* for April commences with an interesting article by Prof. Babington on the *Anacharis alsinastrum* or Canadian water-weed. He shows clearly that there are two series of plants closely resembling each other in appearance, of which one series has perfect triandrous flowers, and the other has incomplete diœcious flowers, of which the males are nearly or quite sessile, and have the curious habit of becoming detached when the pollen is ripe, and floating freely about on the surface of the water, and shedding their pollen there. To the first series belongs the *Elodea* of South America; to the second, *Anacharis* and *Hydrilla*. *Anacharis* would therefore appear to be the true genus to which the English (introduced) plant belongs, as given by Hooker, but not by Bentham and Syme.—Mr. Baker gives one of his useful synoptical revisions of the Cape species of *Anthericum*; and Prof. Thiselton Dyer a history of the substance known as "Australian Caoutchouc," and a valuable account of the mode of germination of *Tropæolum*, which is characteristic rather of endogens than of exogens.

Annalen der Chemie und Pharmacie, January 1872. This number commences with a paper by Max Ascher on the trisubstitution derivation of benzine; this is an attempt to establish the constitution of some of these bodies, but at present, however, it has not been entirely successful.—The next paper is by Linnemann and Zotta "On the reduction of formic acid to formaldehyde and methyl alcohol;" the authors followed exactly the same process as was described by Lieben and Rossi some time since, and which has already been noticed in these pages. The next three communications are by Linnemann "On normal propyl alcohol, its compounds and its conversion into isopropyl alcohol." The author prepared the normal alcohol in two ways—by the action of nascent hydrogen on propionic anhydride, and by obtaining the aldehyde by distillation of calcic

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propionate and formiate, and subsequent treatment with sodium amalgam. The normal alcohol was converted into isopropyl alcohol by preparing from it the iodide, and from this the cyanide, which by treatment with potash yields propylamine. Propylamine hydrochloride on heating with argentic nitrate and water yields isopropyl alcohol, having the characteristic properties and reactions of this body.—Hugo Schiff follows "On the constitution of æsculin;" this is an important theoretical paper.—Quinke contributes the second part of his memoir, "On a new class of aromatic hydrocarbons." By the action of benzyl chloride on toluol, benzyl toluol $C_{14}H_{14}$ is formed with elimination of hydrochloric acid. By oxidation, this hydrocarbon yields benzylbenzoic acid $C_{14}H_{10}O_2$; this by the action of nascent hydrogen yields benzhydrylbenzoic acid $C_{14}H_{12}O_2$; and by the treatment with hydriodic acid the latter yields benzylbenzoic acid $C_{14}H_{12}O_2$.—Translations of two papers, which have already appeared in the French journals, and also a paper by Maly, complete this number.

THE *Journal of the Franklin Institute* for February, after the usual editorial paragraphs descriptive of novelties, has an article by Prof. H. B. Thurston, on Experimental Steam Boiler Explosions, containing a report of a series of experiments undertaken by a committee of the Institute, in conjunction with several railway engineers, for the purpose of testing the conditions under which steam boilers explode—Mr. F. A. Genth continues his paper on the Mineral Resources of North Carolina; and Mr. J. P. Cooke his Chemical Theory of the Voltaic Battery, the portion in the present number being devoted to Electricity.—Prof. P. E. Chase gives a Table of Cyclical Rainfalls at Lisbon, in support of the theory already advanced by him of the lunar influence on the weather. The other papers in this number are mostly of a purely mathematical character.

The first original article in the number for March is chiefly of local interest—"The Locomotive Engine, and Philadelphia's share in its Early Improvements," by J. Harrison, jun., the last recipient of the Rumford Gold Medal.—Mr. James Emerson gives a Report of Water-wheel Tests at Lowell and other places, illustrated with plates.—In another paper on Experimental Steam Boiler Explosions, Prof. Thurston discusses the third experiment at Sandy Hook, New York.—Mr. Joseph S. Smith describes the construction of the Keokak and Hamilton Bridge across the Mississippi, connecting the States of Iowa and Illinois.—Dr. Richard Owen, of the Indiana State University, details a series of experiments on Terrestrial Magnetism.—Prof. R. E. Chase gives tables of the Monthly Rainfall at San Francisco.

THE first article in the *American Journal of Science and Arts* for March is a most interesting account, by Prof. Hayden, of the Hot Springs and Geysers of the Yellowstone and Firehole rivers, accompanied by illustrations and maps. The description of these geysers, which throw those of Iceland completely into the shade, will not bear epitomising, but is well worth reading as a whole.—Two other geological articles are by Prof. Dana, on the Quartzite of the Green Mountains, and by Prof. Silliman, Geological and Mineralogical Notes on some of the mining districts of Utah territory.—Prof. A. E. Verril contributes two instalments of his contributions to zoology, from the Museum of Yale College, on the affinities of Palæozoic Tabulate Corals with existing species, and recent additions to the molluscan fauna of New England.—The other article of greatest interest is by Prof. H. A. Nicholson of Toronto, on the genera *Cornulites* and *Tentaculites*, and on a new genus *Conchicolites*.

THE *Quarterly Journal of Science* for April commences with an article by Mr. R. A. Proctor on Meteoric Astronomy. In reference to the researches of Signor Schiaparelli, he gives an account of the meteoric systems through which the earth passes in August and November, and seeks in meteoric phenomena and the associated phenomena of comets the explanation of some of the features presented by the solar corona. The zodiacal light he explains also on the theory of its being the outer portion of the sun-surrounding meteor families.—Mr. James Douglas, of Quebec, gives a description of the copper mines of Chili, and of the geological and mineralogical features of the country where they occur.—An article on Natural and Artificial Flight describes the results arrived at by Dr. Pettigrew in the case of the flight of birds and insects, and consists to a large extent of extracts from that gentleman's memoirs contributed to the Transactions of the Linnean Society and of the Royal Society of Edinburgh.—Mr. William Topley, in an article on the Geology of the Straits of Dover, illustrated by sections, advocates the project proposed by Hawkshaw and Low of a submarine tunnel, to run from near the South Foreland to a point between Sangatte and Calais, which he believes will pass entirely through the chalk, and will not be likely to be attended by any insuperable engineering difficulties.—An article on the Gold Coinage, and a short one by Captain Oliver on Recent Changes in British Artillery Material, complete the original portion of the number.—Only four books are reviewed this quarter, and more than half the space allotted to reviews is occupied by a notice, by Mr. A. R. Wallace, of Mr. Dale Owen's "The Debatable Land between this World and the Next," in which the reasonableness of the alleged phenomena of modern Spiritualism is advocated.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, April 25.—"On a supposed Periodicity in the Elements of Terrestrial Magnetism, with a period of 26⅓ days." By George Biddell Airy, Astronomer Royal, P.R.S.

In a paper published in the "Proceedings of the Imperial Academy of Sciences of Vienna," vol. lxiv., Dr. Karl Hernstein has exhibited the results of a series of observations which appeared to show that the earth's magnetism undergoes a periodical change in successive periods of 26⅓ days, which might with great plausibility be referred to the rotation of the sun.

It appeared to the author that the deductions from the magnetic oqservations made at the Royal Observatory of Greenwich, and which are printed annually in the "Greenwich Observations," or in the detached copies of "Results of Magnetical and Meteorological Observations made at the Royal Observatory of Greenwich," would afford good materials for testing the accuracy of this law, as applicable to a series of years.

The mean for declination in 1870, and, still more remarkably, the mean for horizontal force in 1870, appear to exhibit an increase about the fourteenth day. But the author does not remark in the other means, either as given in numerals or as projected as curves, anything to support the idea of an inequality periodical in the 26⅓ days. It might almost be suspected that the secular changes used in the period 1850-1852 are too large; but no alteration of these renders the inequality of 26⅓ days more probable. Dr. Hornstein's investigation was limited to observations made in 1870.

Royal Geographical Society, April 22.—General Sir Henry C. Rawlinson, K.C.B., president, in the chair. "On Recent Explorations of the North Polar Region, by Captain Sherard Osborn, R.N. Captain Osborn commenced by alluding to his advocacy of a Polar Expedition *via* Smith Sound, in 1865, and stated that the Duke of Somerset, then First Lord of the Admiralty, though apparently sufficiently favourable to the general proposal of a Government Expedition, urged upon him by a deputation from the Society who waited on him in that year, declined to assume the responsibility of recommending an expedition, owing to the difference of opinion which then reigned with regard to the best route to be followed. The alternate route to Smith Sound was that by the seas of Spitzbergen, advocated by Dr. Petermann and others, on the ground that the Gulf Stream, flowing in that direction, maintained an open sea to the Pole. He (Captain Osborn) and the promoters of the Expedition were content to wait the result of efforts made soon after by the Swedes and Germans to carry out the views of the German geographer. Seven years had elapsed, and we were now in a position to say that the advocates of the Spitzbergen route had been proved entirely wrong, whilst those who believed Smith Sound to be the best route were right. Captain Koldeway, who commanded both the German Expeditions, states, as the result of all his efforts, that "one can hardly resist the conviction that the hope of attaining the North Pole by ship, or of finding an open sea around the Pole, are alike among the most improbable of things. I confess that I myself was misled by representations in Dr. Petermann's 'Geographische Mittheilungen,' and held it to be at least possible by following a line of coast to penetrate by ship far into the central Arctic region, and then certainly to make one's way to the Pole. A winter in East Greenland, the most careful observation of these mighty masses of ice, their movements and formation, and of the whole condition of temperature, have radically cured me and all my companions of this idea. . . . If the principal object be the nearest possible approach to the Pole, I am quite of Osborn's opinion that the best way appears to be through Smith Sound. Here one can penetrate by ship every year to the 78th parallel, and then one has a

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